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THE EFFECT OF VASODILATOR DRUGS (RONIACOL AND PRISCOLINE) ON SK--ETC(U)
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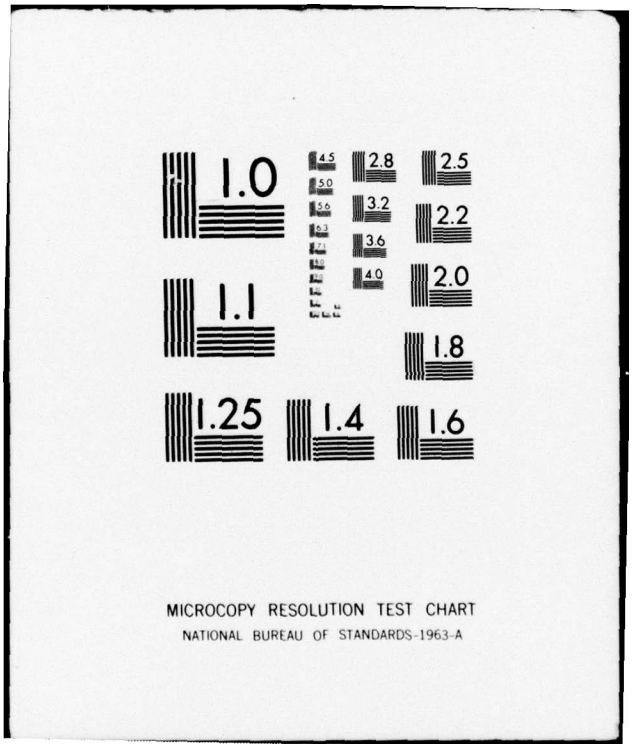
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The Effect of Vasodilator Drugs (Roniacol and Priscoline) on Skin Temperatures and Blood Flow During Mild Cold Stress.

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DEPARTMENT OF NATIONAL DEFENCE — CANADA

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The Effect of Vasodilator Drugs (Roniacol and Priscoline) on Skin Temperatures and Blood Flow During Mild Cold Stress.

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ABSTRACT

Two vasodilator drugs (Roniacol and Priscoline) were tested for their potential prophylactic effect in the prevention of cold-induced vasoconstriction in the hands of human subjects during exposure to mild cold stress. The drugs were administered as a single dose by mouth (300 mg Roniacol or 50 mg Priscoline) to nude subjects lying quietly for 90 minutes at 21°C. Skin temperatures were measured at the left middle finger, the left big toe and the abdomen, also, skin blood flow in the right middle finger was monitored. Neither Roniacol nor Priscoline had any effect on these measurements of skin temperature or skin blood flow as compared to similar measurements made in control (no drug) exposures. Because of these negative findings in nude subjects during mild cold stress, it is suggested that these drugs would provide no significant protection against cold hands for clothed individuals exposed to a more severe cold stress.

INTRODUCTION

Cold hands are a problem for those who work outdoors in cold weather. Cold-induced vasoconstriction reduces blood flow in the hands, causing loss of feeling and an impairment of manual dexterity. Heavy gloves or mittens are not a satisfactory solution to this problem since their use causes delicate hand manipulations to be extremely difficult to perform. Vasodilator drugs appear to be a possible pharmacological solution to the problem of cold hands and feet. These drugs have been used in the treatment of vascular diseases characterized by episodes of peripheral vasoconstriction (3,5). Mountaineers and skiers have also reported taking Roniacol (nicotin alcohol tartrate) or Priscoline (tolazfoline hydrochloride) in the belief that these drugs increase the flow of warm blood to the hands and feet, thereby preventing frostbite (1, 2, 4).

Since none of the available evidence presented in the literature is conclusive, the objective of the present study was to determine in a simple experiment whether a single dose of Roniacol or Priscoline can counteract cold-induced vasoconstriction of the extremities under controlled conditions and whether further detailed experiments are warranted to fully document and exploit any benefit of these drugs in this regard.

METHODS

Six male subjects, aged 20-35 years, were each exposed to an ambient temperature of 21°C and a relative humidity of 50% in a temperature-controlled room. The subjects wore shorts only and lay quietly on a mattress. Thermistor probes (Yellow Springs Instrument Co., Ohio) were attached to each subject via Beckman electrode collars at the following sites: the middle left finger, the left big toe and the abdomen. Skin blood flow in the middle right finger was recorded using the Beckman dynograph recorder with a type 9853 coupler in the voltage/pulse mode. This instrument consists of a small light source and a photoelectric cell which responds to light transmission through the skin, which, in turn, depends on the blood content of the skin. Temperature and blood flow were measured at the respective sites every ten minutes during each exposure.

Each subject was thus exposed three times at 21°C for 90 minutes. For the control exposure, no drug was given. On the other two occasions either Roniacol (300 mg dose) or Priscoline (50 mg dose) was administered orally after 30 minutes exposure, a time deemed sufficient to permit equilibrium of the subject's skin temperature with the ambient environment. The observation

period lasted for a further 60 minutes. The sequence of exposures was random and at least a week lapsed between any two exposures of the same subject to avoid any inter-experimental phenomena.

RESULTS

During the 90 minute cold exposure, the skin temperature of the finger and toe declined steadily to a stable level which was maintained for the last 30 minutes and which was only slightly greater than the temperature of the ambient air. At the same time, the skin temperature of the abdomen decreased by 1 to 2°C. There was no sign of drug-induced vasodilation, as would have been indicated by a rise in skin temperature, in the hour which followed administration of either Priscoline or Roniacol. Table 1 shows the average finger, abdomen and toe temperatures for the six subjects during the last 30 minutes of each exposure at 21°C. There was no difference in these average skin temperatures that could be attributed to the drug treatment.

Since the method of measuring skin blood flow used in these experiments does not yield quantitative values, the data for each individual subject has not been reproduced in this report. Figure 1 shows portions of a typical tracing. In each exposure, skin blood flow in the finger followed the trend indicated by skin temperature, that is, the amplitude of the signal (see Figure 1) decreased progressively with developing vasoconstriction and there was no sign of a reversal due to a drug-induced vasodilation.

DISCUSSION

Vasodilator drugs have been used in cold environments on the assumption that they protect against cold injury. Most anecdotal evidence suffers from the lack of an adequate control exposure in which no drug was administered. For example, in his account of the ascent of the north face of the Eiger (4), a well-known mountaineer reported that he ingested a large dose of Roniacol to prevent what he considered to be imminent frostbite to his feet. The fact that he did not sustain any subsequent tissue loss cannot be considered as a casual effect of the ingestion of the drug.

In the present study, the effect of Roniacol and Priscoline were compared against a control (no drug) exposure. The exposure conditions selected, 90 minutes at 21°C, represented a mild whole body cold stress for a nude (shorts only) individual who was lying quietly. As a result, skin temperature, particularly those of the fingers and toes, decreased due to vasoconstriction. Blood flow in the finger showed the same trend and neither Roniacol or

Priscoline, in the dosages administered, were able to induce vasodilation. Because of these negative findings, during mild cold stress, it is suggested that these drugs would provide no significant protection against cold hands for a clothed individual exposed to a more severe cold stress. Further detailed experiments to fully document and exploit the effect of these drugs in this regard are not warranted.

REFERENCES

ADAMS-RAY, J. (1952). Pathophysiology of cold injuries. In "Cold Injury" Jos. Macy Fdn. p 139

BONNINGTON, C. (1971). In "Annapurna, South Face". Appendix describing medical supplies. Cassell, Lond.

FRIEND, D.G. (1964). Drugs for peripheral vascular disease. Clin. Pharmacol. Ther. 5:666-672.

GILLMAN, P. and D. HASTON. (1966). In "Eiger Direct". Collins Lond. p 165

WINSOR, T. (1967). Occlusive disease of the extremities. Medical treatment. Post grad. Med. 42: 195-202.

TABLE 1

THE EFFECT OF RONIACOL AND PRISCOLINE ON SKIN TEMPERATURES DURING COLD EXPOSURE

Treatment	Average skin temperature (^{o}C)		
	Finger	Abdomen	Toe
No drug	24.3 ± 0.6	31.2 ± 0.5	22.4 ± 0.3
Roniacol	22.6 ± 0.4	31.5 ± 0.3	22.2 ± 0.4
Priscoline	23.4 ± 0.8	30.5 ± 0.6	21.4 ± 0.2

Values are the means ± (60 - 90 minutes) for 6 subjects. Individual skin temperatures at each site were compared using a Kruskal-Wallis test which gives a statistic which was then tested by the Chi Square method using two degrees of freedom. There was no significant difference between treatments.

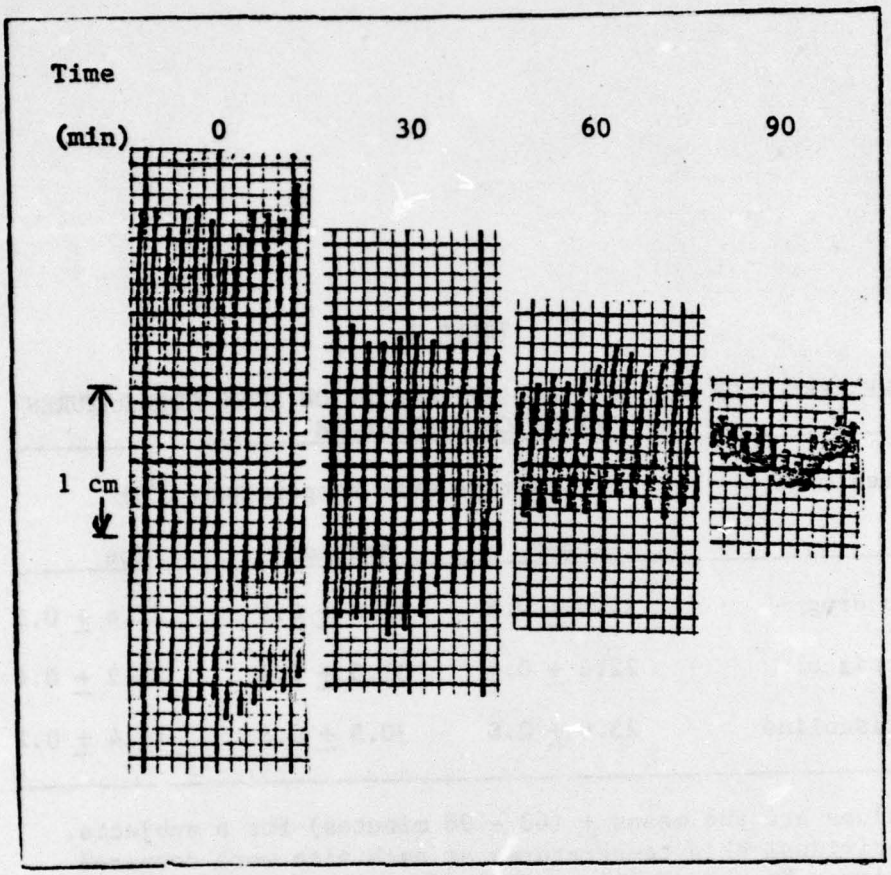

Figure 1: Portions of a characteristic dynograph tracing extracted to illustrate skin blood flow in the finger at 30 min intervals during exposure of one subject at 21°C. Paper speed was 1 mm/sec. Vertical scale shows a pen deflection of 0.5mv/cm. The relative amplitudes at the indicated times demonstrates a reduction of skin blood flow, indicative of vasoconstriction.

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